

WEST

Generate Collection

Print

L1: Entry 2 of 3

File: USPT

Aug 3, 1999

DOCUMENT-IDENTIFIER: US 5933849 A

TITLE: Scalable distributed caching system and method

CLAIMS:

1. A method for implementing a scalable distributed caching system on a network that receives a request from a user for a data object stored on the network, comprising the steps of:
 - a. storing a copy of a data object on an object cache on the network;
 - b. storing a plurality of directory lists on a plurality of directory caches on the network, each said directory list including the network address of a certain object and at least one network address of an object cache on which a copy of the certain object is purportedly stored;
 - c. carrying out a locator function on a receiving cache that receives a request for a given object from a user, the request including a network address of the given object, the locator function using the user request as an input and providing a pointer as an output, wherein the pointer indicates a network of a particular directory cache that stores a directory list for the given object;
 - d. sending an object request message for the given object from the receiving cache to the particular directory cache whose address is indicated by the pointer;
 - e. receiving a directory list for the given object from the particular directory cache, the directory list for the given object including an address of an object cache at which a copy of the given object is purportedly stored;
 - f. selecting alpha object cache network addresses from the directory list for the given object;
 - g. sending a message from the particular directory cache to each selected object cache, requesting each selected object cache to send a message to the receiving cache indicating if the selected object cache stores a copy of the given object;
 - h. sending a message from each selected object cache to the receiving cache indicating if the selected object cache stores a copy of the given object;
 - i. identifying a prime object cache as the object cache that sent the first message received by the receiving cache indicating that an object cache stores a copy of the given object; and
 - j. sending a message from the receiving cache to the prime object cache requesting that the prime object cache send a copy of the given object to the receiving cache.

WEST**End of Result Set**

Generate Collection

Print

L1: Entry 3 of 3

File: USPT

Jun 22, 1993

DOCUMENT-IDENTIFIER: US 5222242 A

TITLE: System for locating a node containing a requested resource and for selectively verifying the presence of the resource at the node

Brief Summary Text (17):

In accordance with the method steps, a LOCATE request is generated at the source logical unit. The LOCATE request identifies a target resource and includes a verification flag indicating whether or not the location and characteristics of the target resource must be verified in a response to the LOCATE request. The LOCATE request is transmitted to the network node serving the source node and is processed there in the following series of operations. The serving network node searches its own cache directory for any entries relating to the target resource. If no entry is found, the serving network node directs searches to other nodes in the network. If an entry is found in a searched cache directory at the network node which serves the target resource, the flag in the LOCATE request is checked to determine whether verification is required. If verification is not required, a LOCATE reply is returned through the network to the network node serving the source resource. If verification is required, the LOCATE request is forwarded to the node identified in the cache entry as containing the target resource.

CLAIMS:

1. In a computer network which includes a plurality of end nodes, at least one network node server for each of said end nodes, and resources associated with said end nodes and said network nodes, each said network node server having a cache directory of information relating to the location and characteristics of at least some of the resources in the network, a method of initiating establishment of a session between a source logical unit associated with a network resource at one of said end nodes and network nodes and a target logical unit associated with a network resource at another one of said end nodes and network nodes, said method comprising the steps of:

generating a LOCATE request at the source logical unit, said LOCATE request identifying a target resource at the target logical unit and including a verification flag indicating whether the location and characteristics of the target resource need be verified in a reply to the LOCATE request;

transmitting the LOCATE request to the network node server for the node containing the source logical unit; and

processing the LOCATE request at the network node server, said processing step further comprising the steps of

searching the cache directory of the network node for any entry relating to the target resource,

if target resource the entry is not found in the searched directory, then initiating a search for the target resource elsewhere in the network by forwarding the search request to other nodes in the network,

if the target resource entry is found in the searched directory, then checking the verification flag in the LOCATE request to determine whether the resource location and characteristics are to be verified,

if the verification flag indicates verification is not required, returning a LOCATE

reply to the node containing the source logical unit, said LOCATE reply being based on the contents of the directory entry,

if the verification flag indicates verification is required, forwarding the LOCATE request to the node identified in the directory entry as containing the target resource, receiving a LOCATE reply originating at the node identified in the directory entry, and returning the LOCATE reply to the node containing the source logical unit, said LOCATE reply being based on the verified contents of the directory entry.

WEST

Generate Collection

Print

Search Results - Record(s) 1 through 3 of 3 returned.☒ 1. Document ID: US 6154811 A

L1: Entry 1 of 3

File: USPT .

Nov 28, 2000

US-PAT-NO: 6154811

DOCUMENT-IDENTIFIER: US 6154811 A

**** See image for Certificate of Correction ****

TITLE: Scalable network object caching

DATE-ISSUED: November 28, 2000

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|-----------------------|---------------|-------|----------|---------|
| Srblijic; Sinisa | Velika Gorica | | | HR |
| Dutta; Partha P. | San Jose | CA | | |
| London; Thomas B. | Mountain View | CA | | |
| Vrsalovic; Dalibor F. | Sunnyvale | CA | | |
| Chiang; John J. | San Francisco | CA | | |

ASSIGNEE-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY | TYPE CODE |
|------------|----------|-------|----------|---------|-----------|
| AT&T Corp. | New York | NY | | | 02 |

APPL-NO: 09/ 204343 [PALM]

DATE FILED: December 4, 1998

PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATION This application is a continuation of U.S. application Ser. No. 08/827,763, filed on Apr. 10, 1997, now U.S. Pat. No. 5,933,849.

INT-CL: [07] G06 F 12/00

US-CL-ISSUED: 711/118; 711/124, 711/130, 707/205

US-CL-CURRENT: 711/118; 707/205, 711/124, 711/130

FIELD-OF-SEARCH: 711/124, 711/123, 711/130, 711/118, 707/205, 395/200.46

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

| PAT-NO | ISSUE-DATE | PATENTEE-NAME | US-CL |
|----------------|----------------|-----------------|------------|
| <u>5317739</u> | May 1994 | Elko et al. | 395/200.46 |
| <u>5452447</u> | September 1995 | Nelson et al. | 707/205 |
| <u>5493668</u> | February 1996 | Elko et al. | 711/130 |
| <u>5787470</u> | July 1998 | DeSimone et al. | 711/124 |

ART-UNIT: 279

PRIMARY-EXAMINER: Yoo; Do Hyun

ASSISTANT-EXAMINER: Namazi; Mehdi

ATTY-AGENT-FIRM: Kenyon & Kenyon

ABSTRACT:

A scalable distributed caching system on a network receives a request for a data object from a user. The caching system carries out a locator function that locates a directory cache for the object. The directory cache stores a directory list that identifies the locations of object caches that purport to store copies of the object requested by the user. The object caches on the object directory list are polled, and in response send messages to the cache that received the user request indicating if each object cache stores a copy of the requested object. The receiving cache sends a message requesting a copy of the object to the object cache that sent the message first received by the receiving cache indicating that an object cache stores the requested object. The object cache that sent the first received message then sends a copy of the object to the receiving cache, which stores a copy and then sends a copy to the user. The directory list for the object is then updated by adding the network address of the receiving cache. Outdated copies of objects stored on object caches are deleted in a distributed fashion to maintain the coherence of the cached copies. This is further reinforced by the association of time-to-live parameters with the each copy and each object cache address on directory lists.

21 Claims, 13 Drawing figures

| | | | | | | | | | | | | | |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|--------------|-------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Drawing Desc | Image |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|--------------|-------|

☒ 2. Document ID: US 5933849 A

L1: Entry 2 of 3

File: USPT

Aug 3, 1999

US-PAT-NO: 5933849

DOCUMENT-IDENTIFIER: US 5933849 A

TITLE: Scalable distributed caching system and method

DATE-ISSUED: August 3, 1999

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|-----------------------|---------------|-------|----------|---------|
| Srbljic; Sinisa | Velika Gorica | | | HR |
| Dutta; Partha P. | San Jose | CA | | |
| London; Thomas B. | Mountain View | CA | | |
| Vrsalovic; Dalibor F. | Sunnyvale | CA | | |
| Chiang; John J. | San Francisco | CA | | |

ASSIGNEE-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY | TYPE CODE |
|-----------|------------|-------|----------|---------|-----------|
| AT&T Corp | Middletown | NJ | | | 02 |

APPL-NO: 08/ 827763 [PALM]

DATE FILED: April 10, 1997

INT-CL: [06] G06 F 12/00

US-CL-ISSUED: 711/118; 711/3, 711/122, 711/124, 711/141, 711/144

US-CL-CURRENT: 711/118; 711/122, 711/124, 711/141, 711/144, 711/3

FIELD-OF-SEARCH: 711/141, 711/3, 711/144, 711/118, 711/122, 711/124, 395/200.46, 707/205

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

| PAT-NO | ISSUE-DATE | PATENTEE-NAME | US-CL |
|----------------|----------------|-----------------|------------|
| <u>5317739</u> | May 1994 | Elko et al. | 395/200.46 |
| <u>5452447</u> | September 1995 | Nelson et al. | 707/205 |
| <u>5493668</u> | February 1996 | Elko et al. | 711/130 |
| <u>5787470</u> | July 1998 | DeSimone et al. | 711/124 |

ART-UNIT: 272

PRIMARY-EXAMINER: Cabeca; John W.

ASSISTANT-EXAMINER: Namazi; Mehdi

ABSTRACT:

A scalable distributed caching system on a network receives a request for a data object from a user. The caching system carries out a locator function that locates a directory cache for the object. The directory cache stores a directory list that identifies the locations of object caches that purport to store copies of the object requested by the user. The object caches on the object directory list are polled, and in response send messages to the cache that received the user request indicating if each object cache stores a copy of the requested object. The receiving cache sends a message requesting a copy of the object to the object cache that sent the message first received by the receiving cache indicating that an object cache stores the requested object. The object cache that sent the first received message then sends a copy of the object to the receiving cache, which stores a copy and then sends a copy to the user. The directory list for the object is then updated by adding the network address of the receiving cache. Outdated copies of objects stored on object caches are deleted in a distributed fashion to maintain the coherence of the cached copies. This is further reinforced by the association of time-to-live parameters with the each copy and each object cache address on directory lists.

16 Claims, 12 Drawing figures

| | | | | | | | | | | | | | |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|-----------|-------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | PMAC | Draw Desc | Image |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|--------|------|-----------|-------|

☒ 3. Document ID: US 522242 A

L1: Entry 3 of 3

File: USPT

Jun 22, 1993

US-PAT-NO: 522242

DOCUMENT-IDENTIFIER: US 522242 A

TITLE: System for locating a node containing a requested resource and for selectively verifying the presence of the resource at the node

DATE-ISSUED: June 22, 1993

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|----------------------|-------------|-------|----------|---------|
| Choi; Owen H. | Raleigh | NC | | |
| Drake, Jr.; John E. | Pittsboro | NC | | |
| Fletcher; James C. | Cary | NC | | |
| Harter; Johnathan L. | Raleigh | NC | | |
| Knauth; Jeffrey G. | Raleigh | NC | | |
| Kramer; Dirk K. | Raleigh | NC | | |
| Lerner; Michael A. | Raleigh | NC | | |
| McKinnon; Joseph L. | Raleigh | NC | | |
| Rafalow; Lee M. | Chapel Hill | NC | | |
| Siddall, William E. | Chapel Hill | NC | | |
| Stump; Melinda P. | Cary | NC | | |

ASSIGNEE-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY | TYPE CODE |
|---------------------------------------|--------|-------|----------|---------|-----------|
| International Business Machines Corp. | Armonk | NY | | | 02 |

APPL-NO: 07/ 589356 [PALM]
DATE FILED: September 28, 1990

INT-CL: [05] G06F 13/14, G06F 13/00

US-CL-ISSUED: 395/800; 395/600, 395/325, 364/241, 364/241.1, 364/242.94, 364/284.3, 364/284.4, 364/DIG.1, 364/940.4, 364/940.5, 364/940.63, 340/825.52
US-CL-CURRENT: 709/227; 340/825.52

FIELD-OF-SEARCH: 395/800, 395/325, 395/600, 395/200, 340/825.52

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

| PAT-NO | ISSUE-DATE | PATENTEE-NAME | US-CL |
|----------------|--------------|------------------|---------|
| <u>4800488</u> | January 1989 | Agrawal et al. | 395/800 |
| <u>4914571</u> | April 1990 | Baratz et al. | 395/600 |
| <u>4941084</u> | July 1990 | Terapa et al. | 395/650 |
| <u>5014192</u> | May 1991 | Mansfield et al. | 395/600 |
| <u>5109486</u> | April 1992 | Seymour | 395/200 |

ART-UNIT: 232

PRIMARY-EXAMINER: Harrell; Robert B.

ASSISTANT-EXAMINER: Harrity; Paul

ATTY-AGENT-FIRM: Woods; Gerald R.

ABSTRACT:

The present invention is an improvement in a known LOCATE process used to locate resources in a computer network. The known LOCATE process always requires that information about a target resource be verified by forwarding a LOCATE request to the node owning the target resource. The present invention improves upon this process by use of selective verification. If predetermined conditions are met, a node in the network may reply to a received LOCATE request by using information about the target resource found in its cache directory. The LOCATE request need not be propagated to the node owning the target resource except for predetermined types of sessions or where past attempts to use selective verification have not been successful.

13 Claims, 10 Drawing figures

| | | | | | | | | | |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|
| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments |
|------|-------|----------|-------|--------|----------------|------|-----------|-----------|-------------|

| | | |
|-------|-----------|-------|
| Basic | Draw Desc | Image |
|-------|-----------|-------|

[Generate Collection](#)[Print](#)

| Term | Documents |
|---|-----------|
| NETWORK | 251886 |
| NETWORKS | 97103 |
| DIRECTORY | 20044 |
| DIRECTORIES | 5896 |
| DIRECTORYS | 4 |
| CACHE | 26799 |
| CACHES | 7460 |
| (DIRECTORY NEAR NETWORK NEAR CACHE).USPT. | 3 |
| (NETWORK NEAR DIRECTORY NEAR CACHE).USPT. | 3 |

Display Format:

FRO

[Change Format](#)[Previous Page](#)[Next Page](#)

WEST

Generate Collection

Print

L1: Entry 1 of 3

File: USPT

Nov 28, 2000

DOCUMENT-IDENTIFIER: US 6154811 A

** See image for Certificate of Correction **

TITLE: Scalable network object caching

CLAIMS:

1. A scalable distributed caching system for users on a network with data objects having network addresses, comprising a receiving cache that receives a request for an object from a user, said receiving cache comprising a data bus connecting a receiving cache processor, a receiving cache computer readable memory and a receiving cache port adapted to be coupled to a network, wherein said receiving cache carries out a directory locator function that uses the user request for a data object as an input and provides a pointer to a directory cache as an output, said directory cache comprising a directory cache data bus connecting a directory cache processor, a directory cache computer readable memory and a directory cache port adapted to be coupled to a network, wherein said directory cache stores a directory list for the requested object in said directory cache computer readable memory, said directory list comprising the network address of the requested object and a network address of an object cache on the network, said object cache comprising an object cache data bus connecting an object cache processor, an object cache computer readable memory and an object cache port adapted to be coupled to a network, and wherein said object cache is adapted to store a copy of the requested object in said object cache computer readable memory of said object cache.

3. A method for implementing a scalable distributed caching system on a network that receives a request from a user for a data object stored on the network, comprising the steps of:

storing a copy of a data object on a first object cache on the network, said object cache having an object cache network address;

storing a directory list on a directory cache on the network, said directory list including the network address of an object and a network address of an object cache on which a copy of the object is purportedly stored;

receiving a request for an object from a user at a receiving cache, wherein the request includes a network address of the object;

performing a locator function at a receiving cache that receives a request for an object from a user, the request including a network address of the object, the locator function using the network address of the object as an input and providing a pointer to the directory cache as an output, wherein the directory cache stores a directory list for the object, where the directory list is a list of addresses of object caches that purport to store a copy of the object; and

sending a request for the object to an object cache on the directory list.